Policy Research

WORKING PAPERS

Macroeconomic Adjustment and Growth

Country Economics Department
The World Bank
July 1992
WPS 931

How Much to Commit to an Exchange Rate Rule

Balancing Credibility and Flexibility

Alex Cukierman
Miguel A. Kiguel
and
Nissan Liviatan

The cost of reneging is a key reason policymakers hold back from strong commitments in their exchange rate policy. The stronger the commitment to an exchange rate rule, the more costly it is to deviate from it.

Policy Research

WORKING PAPERS

Macroeconomic Adjustment and Growth

WPS 931

This paper — a product of the Macroeconomic Adjustment and Growth Division, Country Economics Department — is part of a larger effort in the department to understand macroeconomic adjustment and financial policies. It was prepared for a special issue of Revista de Análisis Económico on Dollarization. Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Raquel Luz, roomN11-059, extension 34303 (July 1992, 32 pages).

Policymakers can support a fixed exchange rate with various degrees of commitment. A regime in which countries can devalue unilaterally represents a weaker commitment than one in which devaluation must be agreed upon with other parties (as in the European monetary system). Full dollarization, understood here as full replacement of the domestic currency by the U.S. dollar, is an extreme commitment to a fixed exchanged rate — is indeed a special case of a fixed exchange rate.

Cukierman, Kiguel, and Liviatan argue that the cost of reneging is a key reason policymakers hold back from strong commitments in their exchange rate policy. The stronger the commitment to an exchange rate rule, the more costly it is to deviate from it. They develop a Barro-Gordon type of model in which the policymaker has to decide the degree of commitment under uncertainty.

They show that, even for policymakers with a strong preference for maintaining the fixed exchange rate, there are circumstances under which they will choose to devalue. They may choose to do so, for example, when the economy is hit by an adverse shock and the costs of adhering to the fixed exchange rate are greater than those associated with devaluing.

Their model makes it possible to understand why many high inflation economies have not adopted full dollarization as a way to stabilize prices. In emphasizing the cost of reneging, they differ from analysts who single out the desire to rely on seigniorage as the main motive for stopping short of full dollarization.

They argue that strong commitments will be made only once there is a good chance the policymaker will not renege, and by then they might not be necessary — a point they illustrate with examples from Latin American countries.

How Much to Commit to an Exchange Rate Rule? Balancing Credibility and Flexibility

by
Alex Cukierman
Miguel A. Kiguel
and
Nissan Liviatan*

Table of Contents

* This paper was prepared for a special issue of Revista de Análisis Económico on Dollarization. We are grateful to the editors, Guillermo Calvo and Carlos Vegh, and to an anonymous referee for helpful comments on an earlier draft.

How Much to Commit to an Exchange Rate Rule: Balancing Credibility and Flexibility

Alex Cukierman, Miguel A. Kiguel and Nissan Liviatan

I. Introduction

A fixed exchange rate can be supported by various degrees of commitment. The gold standard represents the strongest possible commitment, in the sense that domestic money must be fully backed by gold, governments have no leeway in setting the money supply, and changes in the parity are extremely rare events. A currency board is a slightly weaker commitment, as domestic currency may be only partly backed by foreign assets. Similarly, the fixed exchange rates regime under the Bretton Woods system was even weaker, as central banks were not required to back the issuance of money with foreign assets, and devaluations were accepted as part of the rules of the game (especially to deal with external imbalances).

Fixed exchange rates have become a central component in many disinflation programs. The successful stabilization programs of Israel (1985) and Mexico (1987) started with a fixed exchange rate, and so did the less successful Austral plan in Argentina (1985) and the Cruzado plan in Brazil (1986). The Chilean stabilization process of 1974-82 relied on a fixed exchange rate at a late stage for around three years. Likewise Denmark and Ireland and other European countries fixed their exchange rates within the EMS.[1]

---

[1] The first four programs are described in Bruno, Fischer Helpman and Liviatan (1991). Giavazzi and Pagano (1991) examine the Danish and Irish stabilization programs.

An important difference among these programs is the strength of the commitment to the fixed exchange rate. The weakest commitment states that the exchange rate will be fixed (in order to provide a nominal anchor for the stabilization program), but with the implicit understanding that the rule will be changed if inflation persists (e.g. in the Cruzado plan). A stronger commitment is effected when the fixed exchange rate is supported with a promise not to print money to finance the budget deficit, as for example in the Israeli program or the Austral Plan. A third group of countries went further by supporting the fixed exchange rate with a legal obligation to back all or part of the issuance of money with foreign assets, as in the programs aimed at stopping the Europeans hyperinflations in the 1920s, or in the 1991 Convertibility plan in Argentina.[2]

Full dollarization, understood as complete substitution of the U.S. dollar for the domestic currency as the only legal tender, is a special case of a fixed exchange rate. While this regime has been proposed as a way to bring down inflation, it has not yet been implemented in Latin America for this purpose. A distinctive feature of this arrangement is that the government gives up the privilege to collect seigniorage.[3] We want to make clear at this point that full dollarization can be abandoned, in the same way that countries in the past renege from strong commitments, such as during the gold standard. During that era, countries either suspended convertibility of the domestic currency or alternatively devalue the currency when facing severe external shocks. In both cases the decisions implied reneging on a commitment that was probably equivalent to what full dollarization would be nowadays.

---

[2] Canavese (1992) provides and excellent description of the convertibility program.

[3] Panama is the only fully dollarized economy in Latin America, but its original adoption was not related to an attempt to stop high inflation.

By making a stronger commitment, a policymaker "ties his hands" to a certain degree and hence he is more likely to successfully affect inflationary expectations. The reason is that the political costs of reneging from a given exchange rate regime are generally larger the tighter the commitment implicit in that regime. As a consequence the announcement of a fixed exchange rate has a stronger impact on expectations when it is associated with monetary institutions that imply a stronger commitment. But, even strong commitments can be broken.

This paper examines the considerations that policymakers typically take into account before choosing a commitment level. We view the strength of the commitment as being inversely related to the potential costs of reneging on it. An implication of this approach is that one explanation for not observing high inflation countries rushing to full dollarization as a way to bring down inflation is that policymakers are not sufficiently confident that they can sustain the regime for a prolonged time, especially because such economies are prone to large, adverse external shocks. It is this concern that induces their policymakers to maintain national currencies.

The need to raise seigniorage is less important in our view. The economies that are now considering full dollarization are those that are seriously trying to stabilize, and hence are willing to eliminate the budget deficit. In addition, if they succeed in stabilizing, the revenue from seigniorage is likely to be small (low inflation economies generally collect around one percent of GDP from seigniorage). In Argentina or Brazil, this amount represents around 3 percent of revenues of the consolidated public sector. It is thus doubtful that a serious stabilizer will not dollarize because he is worried about losing this relatively meager revenue.

There are a number of reasons that can force governments to finally devalue. In almost every case devaluations are induced by balance of payments problems. In some cases the external difficulties arise from inconsistencies in the design of the program, e.g. the exchange rate is maintained fixed while at the same there are significant budget deficits financed by money creation. In other cases, however, adverse external shocks or unfavorable domestic political developments are the main causes for reneging on an announcement. As a result, in an uncertain world, the ability to precommit is greatly affected by the nature and distribution of shocks.

A second type of problem is that the public is typically uncertain about the extent to which the policymaker in office views his announcement as a serious commitment. Policies to stabilize prices are put in place by governments who are ready to pay the related costs, as well as by those who most likely will abandon them as soon as signs of hardship show up. It is thus difficult to anticipate, at the beginning, what will be the response of a policymaker. As a result, most stabilization programs face adverse expectations in the sense that even a policymaker who largely intends to be live up to his policy preannouncements is not fully believed.

The purpose of this paper is to identify the factors which determine the strength of commitment that policymakers choose to back up a fixed exchange rate system. In practice the commitment level is achieved by choosing a particular set of monetary and exchange rate arrangements. Section II develops a Barro-Gordon type model in which the policymaker has to decide how much to commit under uncertainty. An important assumption is that the stronger the commitment to the fixed exchange rate the greater the political cost of reneging on it. Thus, prior to deciding on the choice of exchange rate arrangements the policymaker has to weigh the benefits, to the

disinflation program, from making a strong commitment against the potential costs of being forced to renege on it. Some of the more technical details are presented in appendices. Section III illustrates the results of the model with examples from Latin American countries. We conclude in section IV with a comparison of the results of our approach with related work.

II. The Model

The model highlights the trade off between credibility and flexibility.[4] We assume that the policymaker has some degree of freedom in determining the strength of his commitment to a fixed exchange rate policy. An assertion such as "the exchange rate is pegged to the dollar for the time being but the policy will be reexamined shortly" is a weak commitment. A fixed exchange rate which is a cornerstone of a major stabilization program (as in the Austral plan in Argentina) is a stronger commitment.

We shall model the uncertainty about the seriousness of the policy announcement by assuming that there are two types of policymakers - a dependable one (D) who is subject to a reneging cost and an alternative policymaker (W) who is not bound by his policy announcement. D incurs a cost of reneging which W does not. The public has a prior probability (α) that the policymaker is D. This prior is used in forming expectations.

The objective functions of D and W are given by a modified version of the Barro-Gordon model.

$$J_D = x(\pi - \pi^e) - h\frac{\pi^2}{2} - bc \qquad (1a)$$

[4] Related discussions appear in Flood & Isard (1989) and Lohmann (1992).

$$J_W = x(\pi-\pi^e) - \frac{h\pi^2}{2} \qquad (1b)$$

$x \geq 0, \quad 0 \leq c \leq 1, \quad h, b > 0.$

$\pi-\pi^e$ denotes the surprise-devaluation, i.e. the devaluation in excess of what was expected. By creating a surprise devaluation the policymaker can create a temporary real devaluation, or a reduction in real wages, which will improve the trade balance. However, devaluation (inflation) as such is undesirable, as is reflected by the term $(-\frac{h}{2}\pi^2)$.

If D announces a fixed exchange rate he also chooses the degree of commitment c. The cost of deviating from the rule is bc, where b is a fixed parameter that determines the size of the cost incurred by D when he reneges on a commitment of degree c. One reason for the existence of this cost is that a broken commitment undermines the subsequent dependability of the policymaker (both in economic as well as in political terms). This is something that D cares about but W does not. Breaking a commitment shows that the policymaker is unable to live by the rules which he himself set. However, abiding to the rules is an essential input into the reduction of long term inflationary expectations (this goes beyond π^e in our model). We interpret c as the proportion of agents who take the exchange rate announcement seriously. We assume that the policymaker can influence this proportion by the strength of his assertion. However, the larger is c the larger will be the cost of reneging. W does not incur any cost of reneging.

The parameter x measures the relative importance that the policymaker attaches to output gains from surprise inflation as compared with his aversion to inflation (devaluation) as in the Barro-Gordon model. We

consider x as a being subject to shocks which may be due either to external developments (a balance of payment crises may raise the preference for output gains) or to unexpected changes in the balance of power between groups which favor a reduction in unemployment and those who attach greater importance to price stability.

The interaction between the policymaker in office and the public can be thought of as a four-stage game which relates to a fixed exchange rate regime. First the policymaker chooses his degree of commitment (c) to the regime. In the second stage the preference parameter (x) realizes. In the third stage, after the realization of x, the public forms its expectation of the rate of devaluation π^e. In the fourth, and final, stage the policymaker picks the actual rate of devaluation (π). If D does not renege $\pi_D=0$, and if he does $\pi_D>0$ as will be seen later. The following figure summarizes the timing of events.

1	2	3	4
Policymaker chooses c	x realizes	public forms expectations π^e	Policymaker Picks π

Note that the only thing which the public does not know in stage 3 is the identity of the policymaker. The announcement of c in the first stage does not reveal the type because W, for whom the announcement is costless, will always mimics D's announcement (but not necessarily his acts).

To ensure the time consistency of the solution for D we start from the final stage and work backward in the dynamic-programming fashion. According to (1) D will renege on the fixed exchange rate if his benefit from maintaining $\pi=0$ is less than the benefit of adjusting π optimally in view of

the realization of x. In the case of reneging both W and D will find it optimal to set

$$\pi_w = \frac{x}{h}. \tag{2}$$

According to (1) D will renege if

$$x\left(\frac{x}{h} - \pi^e\right) - \frac{x^2}{2}h - bc > -\pi^e x \tag{3}$$

which implies that reneging will take place when

$$x > (2hbc)^{\frac{1}{2}} \equiv x_c \tag{3'}$$

Hence

$$\pi_D(x) = \begin{cases} 0 & if \quad x \leq x_c \\ \frac{x}{h} & if \quad x > x_c \end{cases}. \tag{4}$$

For any agent who takes the announcement of the fixed exchange rate seriously the expected Π is $\alpha\pi_D + (1-\alpha)\pi_w$. We assume that for any other agent $\Pi^e = \Pi_w$. Since the proportion of the former group is c, the (average) expected Π in the population is

$$\pi^e_{(x)} = c[\alpha\pi_D + (1-\alpha)\pi_w] + (1-c)\pi_w = c\alpha\pi_{D(x)} + (1-c\alpha)x. \tag{5}$$

Hence

$$\pi^e(x) = \begin{cases} (1-\alpha c)\frac{x}{h} & if \; x \leq x_c \\ \frac{x}{h} & if \; x > x_c \end{cases}. \tag{6}$$

D's objective in stage 1 is as follows:

if $x \leq x_c$

$$J_D(x) = x\left(0-(1-\alpha c)\frac{x}{h}\right) - \frac{0.h}{2} = -(1-\alpha c)\frac{x^2}{h} \tag{7}$$

and if $x > x_c$

$$J_D(x) = x\left(\frac{x}{h}-\frac{x}{h}\right)-\frac{h}{2}\left(\frac{x}{h}\right)^2-bc = -\left(\frac{1}{2h}x^2-bc\right) \tag{8}$$

Hence

$$Q(c) \equiv EJ_D(x) = \int_0^{x_c} -(1-c\alpha)\frac{x^2}{h}dF(x) - \int_{x_c}^{\infty}\left(\frac{x^2}{2}h + bc\right)dF(x) \tag{9}$$

where F is the distribution function of x and (from (3')) $x_c = (2hbc)^{\frac{1}{2}}$.

We assume, for simplicity the uniform distribution with density K in the interval [0,a], i.e. $0 \leq x \leq a$.[5] The objective function can then be written as

$$Q(c) = -K\left[\left(\frac{1-\alpha c}{h}\right)\int_0^{x_c} x^2dx + \int_{x_c}^{a}\left(\frac{1}{2h}x^2 + bc\right)dx\right]. \tag{10}$$

After some algebra this reduces to

$$aQ(c) = -\left(\frac{\frac{1}{2}-\alpha c}{3h}\right)x_c^3 - \frac{a^3}{6h} + bcx_c - bca. \tag{11}$$

A straightforward calculation (see appendix) shows that the second order derivative of Q with respect to c is always positive. Hence the optimal value of c occurs at the boundary of its range, and must, therefore,

---

[5]Note that aK=1. It is also assumed that at c=1 $x_c<a$, i.e. there are values of x for which D will renege.

be at either c = 0 or c = 1. This special feature is not an essential part of the problem. It is a consequence of the particular density function chosen. But since, the main qualitative results of our discussion carry over to more general cases we illustrate them, for simplicity, by means of the uniform distribution.

The maximal commitment c=1 arises when Q(1) > Q(0). This implies (see appendix) that there is a commitment when the following inequality holds

$$\Delta \equiv a\,[Q(1) - Q(0)] = \left(\frac{\alpha - \frac{1}{2}}{3h}\right) x_c^3 + b(x_c - a) > 0^{1/2}. \tag{12}$$

It follows from this inequality that a commitment is more likely to result, when credibility (α) is higher and when the range of x (i.e. a) is smaller (since $x_c < a$ there will be no commitment with $\alpha < \frac{1}{2}$). This likelihood will also rise with h provided $\alpha > \frac{1}{2}$ (this is a sufficient but not necessary condition). The effect of a larger b is ambiguous.[6]

Let us turn now to the intuition behind these results.

Consider first the effect of α on commitment. Viewed from stage 1 (before the realization of x) the expected value of π^e (x), when D is in office is

$$E_x \pi^e(x) = \begin{cases} \dfrac{Ex}{h} - \alpha \dfrac{b}{a} & \text{when } c = 1 \\ \dfrac{Ex}{h} & \text{when } c = 0 \end{cases} \tag{13}$$

---

[6]A larger b enables a stronger commitment, with c=1. However, it also increases the risk of paying a high reneging cost in case of an unfavorable shock.

where Ex is the expected value of x (also equal to $\frac{a}{2}$). Hence by making a commitment (setting c=1) expectations are reduced by $\alpha\frac{b}{a}$. Thus the larger is α the larger the average reduction in inflationary expectations that is achieved through the commitment to a fixed exchange rate regime.

A similar calculation with respect to π_D (the average realized rate of devaluation when D is in office), yields

$$E_x\pi_D(x) = \begin{cases} \frac{Ex}{h} - \frac{b}{a} & \text{when } c = 1 \\ \frac{Ex}{h} & \text{when } c = 0 \end{cases} . \qquad (14)$$

Note that (Unlike to $E_x\pi^e(x)$ in equation (13) this term is independent of α. Hence, the larger is x the lower is α the lower is the average negative surprise inflation in the presence of a commitment (c=1) when D is in office. From (13) and (14) this surprise inflation is given by

$$E_x\pi_D(x) - E_x\pi^e(x) = -(1-\alpha)\frac{\alpha x_c^2}{2ah}. \qquad (15)$$

Hence the larger is α the larger the beneficial effect of a commitment on unexpected inflation. On the cost side, the commitment (with c=1) implies an expected value of costs (viewed from stage 1), through bc, equal to $bc(a-x_{c1})$ which is independent of α. Thus raising c from 0 to 1 leads to a larger reduction in $E\pi^e(x)$ when α is larger but this consideration does not affect costs. This explains why a higher reputation is conducive to a stronger commitment.

It can be seen from (12) that an increase in 'a' reduces the likelihood of a commitment. This is so because a larger 'a' i.e. a wider range of variation for x, implies a higher expected cost associated with reneging. Note that an increase in 'a' is a simultaneous increase both in expected x and its standard deviation leaving the coefficient of variation constant. Consequently, another way of expressing the foregoing result is by saying that an increase in Ex, holding the coefficient of variation constant, will reduce the tendency to make a commitment on fixing the exchange rate.

The intuition underlying the result that a larger h raises the likelihood of a commitment is straightforward. A larger h means that the policymaker is relatively more concerned about the costs of inflation. Since actual inflation is lower in the presence of a commitment than in its absence (see equation (14)), the commitment is more valuable the larger is h.

Before discussing the implications of the model in more detail, it is important to point out some of its limitations for empirical analysis and ways in which it can be extended. First, the fixed cost of reneging (c) is intended to capture the inability of D of revealing himself as the dependable policymaker or alternatively the costs of not being able to stick to announcements. The nature of these costs is not explicit in a one period model of the type used in the paper, but it is easy to interpret them once we extend the model to two periods. If D reneges in the first period he is not revealed as being the dependable policymaker, and/or one who sticks to his announcements. As a result, he cannot reap the benefits of a good reputation in the second period. In much of the discussion that follows we assume that the results of the model can be extended to a multiperiod framework. Second, while the policymaker is free to choose any value of c between 0 and 1, when we conduct the analysis using the uniform distribution we find out that the

policymaker will choose either full, or not commitment at all. While this is a restrictive result, we show in appendix 3 that for a general distribution function it is possible that the policymaker chooses an internal solution.[7] Thus in general, the policymaker has more options regarding the degree of commitment than what is implied by the uniform distribution case. Third, in the model we assume that the public has a prior probability (α) that the policymaker in office is D. While α is exogenous in the model, it could be endogenized by including prior actions on the fiscal deficit. In practice, policymakers do not signal only on one front. Instead they try to enhance their reputation by making policy decisions in various areas.

III. Practical Implications of the Theory

This section illustrates the practical implications of the model presented above with specific examples drawn from the experiences of Latin American countries during stabilization attempts. In particular, we provide examples that indicate the different degrees of commitment in various stabilization programs, and show how these commitments are related to some of the variables suggested in the model. We also examine some of the reasons that led policymakers to renege on announcements, and explore the consequent costs.

i. Degree of Commitment

Policymakers have a range of options regarding the type of exchange rate rule that they announce to support stabilization programs. In some cases they announce a fully fixed exchange rate, while in others they opt for

---

[7] The full implications of this case need to be study in more detail, something that we plan to do in future work.

a preannounced crawling peg. This paper focusses on cases in which the policymaker announces a fixed exchange rate. The announcement can be backed in different ways. In some cases this involves not printing money to finance the budget deficit (while the option of providing credit to the private sector is maintained), in others to issue money only to buy foreign exchange. Finally, the commitment to the exchange rate rule can be supported with full convertibility or with restrictions on the capital or current account, in which case a parallel foreign exchange market usually develops. It is easier for policymakers to stick to their exchange rate commitment by introducing such restrictions. However, when they follow such a course of action they damage their reputation, and reduce the chances that their policies will succeed in the long run.

The strength of commitment depends on the combination of these three elements. The stronger commitment corresponds to cases where the exchange rate is fixed, the monetary base is <u>fully</u> backed by foreign exchange and there is <u>full</u> convertibility of the domestic currency. Additional features that one might want to consider for evaluating the seriousness of the commitment to a fixed exchange rate regime are the degree of independence of the central bank in setting the exchange rate and/or monetary targets, and the conditions under which a devaluation can take place.[8]

Empirically, the convertibility plan launched in Argentina in March 1991 represents one of the strongest commitments made so far in Latin America. The central components of the plan were a fixed exchange rate to the US dollar, established by law with a ceiling at 10,000 Australes per U.S. Dollar, and an obligation to print money only to purchase foreign exchange.

---

[8] There is some evidence suggesting that, other things the same, inflation is lower in countries whose central banks preannounce monetary targets (Cukierman (1992) chapter 20, section 5).

There was full convertibility of the domestic currency as all restrictions on external payments were eliminated. Legally, the monetary base had to be 100% backed by foreign assets, although part of this (around 10%) could be public debt denominated in foreign currency valuated at market prices. A key element in enhancing the strength of the arrangement was the inability of the central bank to devalue, since this action required Congressional approval.

Examples of weaker commitments are fixed exchange rates of the type used in the Krieger Vassena stabilization program in Argentina in 1967, and in Chile starting in June 1979, when the administration fixed the Peso at $39 per U.S. dollar.[9] In both cases, there was a strong commitment to the fixed exchange rate, in the sense that the exchange rate was a symbol of overall nominal stability. In addition, there were essentially no restrictions on the current and the capital account (evidence of this was a very small or non-existent parallel foreign exchange market). On the other hand, in these two instances the central bank maintained control of exchange rate policy, and there was no legal requirement to back domestic currency with foreign assets.

The fixed exchange rate announced in the Austral plan and in the 1985 Israeli program were examples of even weaker commitments. The authorities announced a fixed exchange rate and promised not to print money to finance the deficit. However, it was not clear how long the exchange rate would remain fixed, and the limitations on printing money were not supported by strong legislation.

Finally, the announcements of a fixed exchange rate in the Cruzado plan in Brazil and in the various programs that followed it, as well as those that

---

[9] De Pablo (1972) examines the Krieger Vassena program while the Chilean experience in analyzed in Corbo (1985) and Edwards and Edwards (1987) among others.

followed the Austral plan in Argentina represent cases of very weak commitment. Policymakers did not tie their hands in any way, and it was clear from the outset that their main objective was to halt an inflationary acceleration rather than to bring about permanent price stability.

In Europe, during the end of the eighties some members of the EMS like Italy and France became strong supporters of a European monetary union. Since the same countries previously had a clear preference for national monetary flexibility their support of a monetary union constitutes a marked shift towards a preference for a stronger commitment to fixed exchange rates.[10]

ii. What Explains the Degree of Commitment?

The model developed in the previous section indicates that the degree of commitment preferred by policymakers depends on the direct costs of reneging (b), the distribution of the shock x as characterized by its upper bound, 'a', the aversion to inflation (h), and the prior that the public has regarding whether the government is dependable or weak (α). A casual look at stabilization experiences in Latin America indicates that these are useful parameters for explaining the flexibility of exchange rate policy.

The discussion of the previous subsection implies that the Argentine stabilization attempts can be ranked in terms of their degree of commitment to a fixed exchange rate in the following manner: First, the Convertibility Program (1991); second, the Krieger Vassena plan (1967); third, the Austral plan (1985), and fourth, those that follow the latter. What explains those different commitment levels?

---

[10]Chapter 6 of Cukierman (1992) shows that from the point of view of an individual country replacement of the EMS by a monetary union constitutes a stronger commitment.

When the Convertibility plan was launched the overall situation was ripe for a strong stabilization program. The fiscal position had improved in 1990, when the government maintained a modest primary surplus and a much lower overall budget deficit than in previous years. Without question, in early 1991 the country enjoyed the strongest fiscal balance of the preceding 20 years.[11] Since the possibility of maintaining a sound fiscal position was also better than in previous years it was probably easier to convince the public that the policymaker would stick to his commitment.

A second important consideration was the public's demand for price stability as a result of the tremendous costs associated with the previous hyperinflation. The fact that agents were more willing to make concessions strengthened the position of the government and in this sense it made it more likely to be of the dependable type; in terms of the model, it could be argued that both α and h had increased. The government certainly had increased its reputation prior to March 1991, as it had already taken numerous structural measures aimed at demonstrating a break from the past. Particularly important in this respect were the privatization of public sector enterprises, policies to reduce the size of the public sector and to reduce government intervention in the markets. Finally, the potential costs of an adverse external shock were dampened by the fact that the country was running a record high trade surplus. This provided a large enough cushion to withstand a deterioration in the terms of trade or a temporary increase in imports characteristic of exchange rate based stabilizations (in other words, 'a' was considered to be small by policymakers).

---

[11] Of course, the fiscal situation was not strong enough as to erase any doubts of a reversal. Nevertheless, on an ex-ante basis the program had a reasonable chance of success.

If one compares the initial conditions with those in the Austral plan, it is clear that the situation was more fragile in the latter case, and hence the probability of reversal was larger. Although the budget deficit was reduced from 16 to 5 percent of GDP, the deficit was larger than prior to the convertibility plan, while much of the reduction in the deficit was based on temporary measures. This indicates that there were probably more doubts as to whether the policymaker was of the dependable type (α was probably much smaller than in the convertibility program).

In between these two programs lies the Krieger Vassena plan, which was unquestionably the most serious stabilization attempt prior to the convertibility plan. The commitment to the fixed exchange rate was strong in the sense that when they fixed it at 350 pesos to the dollar (after an initial 40% devaluation) it was viewed as a symbol that would measure the success or failure of the program (much in the same way as in the 1991 convertibility plan). A relevant question is why didn't the authorities tie their hands further by adopting full convertibility? After all, the fiscal balance was probably as strong as it ever had been, while the economy was enjoying a relatively comfortable external position.

There are two possible explanations for stopping short of full convertibility in the Krieger Vassena program. The first one is that it was implemented during the Bretton Woods era in which full convertibility was considered as unnecessarily restrictive. A commitment of this type was simply not considered within the feasible set of policy options. Second, the overall economic situation, especially the initial rate of inflation, was much more manageable in the 60s than more recently. This means that b, the fixed cost associated with reneging from a commitment was smaller, while h,

the aversion to inflation was higher. So even for the same α and 'a' it was still rational to commit strongly through a fixed exchange rate.

A related issue is why was the commitment weak in the programs that followed the Austral plan? The typical program implemented between 1986 and 1989 (including the Bunge and Born plan to stop hyperinflation) was based on a fixed exchange rate, supported by price and wage controls, but a relatively small fiscal effort (usually temporary increases in revenues). The state of the underlying fundamentals made such a weak commitment reasonable. The large budget deficits could be reduced only temporarily through increases in public sector prices and the levying of emergency taxes. In addition, the country had a weak external position with limited access to external financing. Finally, there was a large quasi-fiscal deficit, much of it driven by high interest rates, which was almost automatically monetized. Since, under those circumstances even small shocks could destabilize the program, policymakers avoided strong commitments.

Finally, an interesting question is why didn't Peru, a country that like Argentina experienced a hyperinflation and which has gone through a similar stabilization process, adopt a convertibility program. The stabilization program in Peru was launched in August 1990 in response to a drastic and long hyperinflation. This was an orthodox money based program, similar to the one that successfully stopped hyperinflation in Bolivia in 1985. The results in Peru have been mixed. Hyperinflation stopped but inflation has remained stubborn at around 5 percent per month. Although the government has been successful in securing a balanced budget on a cash basis the stabilization effort still faces large risks. That could explain why the exchange rate commitment has been weak so far. The model predicts that the larger the probability of adverse shocks (the larger is a), the less likely

it is that the policymaker will make a strong commitment to a fixed exchange rate. While the stabilization program has been moderately successful, it certainly continues to be extremely fragile. On the fiscal side, government revenues are very low (around 8 percent of GDP), a level which is not enough to sustain the necessary level of current and capital expenditures. In addition, the external situation continues to be fragile. While Peru has restored the dialogue and/or entered into negotiations with the multilateral organizations and the commercial banks, it is still far from receiving voluntary lending from the private sector. These two weakness of the program probably generate enough uncertainty so as to prevent the government from feeling sufficiently secure to make a strong commitment such as full convertibility.

The fact that so far Peruvian authorities have relied primarily on tight money and have avoided entirely using the exchange rate as a nominal anchor is in itself an indication that they consider the potential costs of reneging on an exchange rate announcement as high -- even for a relatively weak commitment. Hence they probably consider that before entering this phase the external and fiscal conditions need to be in much better shape. In terms of the model α is low and 'a' high. Both features tend to discourage the use of the exchange rate as a nominal anchor.

iii. <u>When to Renege on a Commitment?</u>

One feature common to many exchange rate based programs is that policymakers tend to stick to the fixed exchange rate even past the point at which it becomes clear that a devaluation is necessary. It seems that the perceived cost of deviating from the rule creates an incentive to stick with the policy even if this implies a bigger cost at a later stage.

One example of this type is the period of a fixed exchange rate in Chile in the late seventies and early eighties. In 1978 the Chilean authorities started to preannounce the exchange rate and gradually reduced the announced rate of devaluation as part of their strategy to reduce inflation. In June 1979, in response to the slow pace of inflation reduction (which was still running above 35 percent per year), the authorities fixed the exchange rate at $39 per US dollar. This was presented as a strong commitment to the stabilization program, with the idea that the exchange rate would remain fixed for the foreseeable future. While inflation slowed down in response to the new policy, it remained well above international levels and resulted in a strong real appreciation. In 1981, there were clear signs of looming problems. The current account deficit had increased to around 17 percent of GDP, well above sustainable levels, while real interest rates reached 58 percent, mainly because the private sector was already anticipating a devaluation.

The devaluation finally came in June 1982, in response to a severe deterioration in the balance of payments prompted in part by a sharp fall in the price of a copper, and a tightening in foreign lending. It now seems clear that earlier action on the exchange rate would have reduced the large costs associated with the drastic real appreciation and the ensuing depreciation (which are discussed in section III.iv). However, the authorities chose to wait and instead only devalued when forced to do so by the size of the external shocks.

The Chilean experience fits very nicely with the predictions of the model. When they made the initial commitment in 1979, they probably considered the parameter b to be large, and they chose to make the strong commitment because the prior was that they were perceived as a strong

government (α was estimated to be high). However, once they established the strong commitment it was extremely difficult to deviate from it, probably because the anticipated cost of this action was very large. They would only deviate from it once it became clear that there was no other reasonable option. As a result they over-extended the period of the fixed exchange rate and made things worse in the longer term.

It is interesting to note that we also observe an over-extension of the period of fixed exchange rates even in programs where the commitment is weak. A clear example of this type is the Brazilian Cruzado plan of February 1986, where a program based on a fixed exchange rate and a wage and price freeze was implemented to stop high rates of inflation (in excess of 20 percent per month). The Cruzado plan quickly ran into difficulties, as reflected in a sharp depreciation of the Cruzado in the parallel market, the existence of widespread shortages of goods which led to the emergence of black markets, and a deterioration in the trade balance. In spite of these symptoms the government maintained its policies, and only changed them after the November election took place. Once again, the explanation for not taking earlier action on the exchange rate was that there was a cost (c), in this case political, on reneging on the announcement.[12]

iv. <u>The Costs of, and the Reasons for Deviating from a Fixed Exchange Rate Rule</u>

---

[12] The stabilization program implemented in Uruguay in 1967 provides another example of a case where the fixed exchange rate was maintained longer than was reasonable because of the political cost of reneging on a preannouncement. The authorities ultimately devalued but only after the 1971 election. As in the recent Cruzado program, the parallel rate had depreciated significantly well before the devaluation, and the symptoms of overvaluation were felt economy-wide. This episode is analyzed in Viana (1989) among others.

It is difficult to identify and measure precisely the costs of reneging once an announcement is made. What the model of the previous section indicates is that these costs increase with the strength of the commitment. We will now illustrate the nature and magnitude of the costs involved in departing from an announced rule.

The Chilean devaluation of June 1982 illustrates some of the costs that can be associated with over-extending the period of the fixed exchange rate and then effecting a late maxi-devaluation. By and large, the main costs were a steep recession (output fell by 14 percent in 1982), a financial crisis, and a sharp increase in the fiscal deficit as a result of subsidies provided to firms and the financial system to offset the effects of the devaluation.

The 1982 recession was the largest one in Chile since the depression of the thirties. Although part of it can be explained by the adverse external shocks of 1981-82, domestic factors were probably equally (if not more) important in this case.[13] There was a tightening of domestic policies starting in the second half of 1981, which were adopted with the intention of reducing domestic prices and improving the balance of payments. A second cost was the large financial crisis caused by the extremely high (ex-post) real interest rates during the years that preceded the devaluation. A third important cost resulted from the government provision of a host of (post devaluation) subsidies to compensate agents that had contracted loans in foreign currency. While this was extremely costly to the public sector, one could argue that it was not entirely unreasonable since those loans were originally taken on the basis of a given rule (that the government would

---

[13] Minister Luders argued at the time that approximately two thirds of the recession was caused by domestic policies.

stick to the fixed exchange rate rule). Once the government reneged on its rule and devalued, domestic borrowers suffered a large capital loss.[14] Since the government could not distinguish between agents that had borrowed fully believing the announcement and those which did not, an argument was created for compensating all borrowers. In any case, the costs of these policies were extremely onerous to the public sector.

In Chile, these losses were absorbed by the central bank, and appear in the quasi-fiscal deficit. Marshall and Schmidt-Hebbel (1991) present estimates of these deficits for the 1982-85 period. These losses averaged 10 percent of GDP during those years. A decomposition of these losses indicate that the main factors were loan subsidies to bankrupt financial institutions, and losses arising from exchange rate guarantees.

The sheer size of the costs of sticking for too long to the fixed exchange rate in Chile indicates that indeed they are positively correlated with the strength of the commitment. Interestingly, while Chile suffered large output and fiscal losses, the stubbornness with which the government adhered to the exchange rate rule had one benefit: the crisis did not lead to a resurgence of high inflation later on, in fact inflation has remained moderate (at around 20 percent per year) ever since.

The Argentine devaluation of 1970, which marks the end of the stabilization attempt started under Krieger Vassena is a second example of reneging on a strong commitment. The devaluation (25 percent) was a clear indication that the low rates of inflation that the program was aiming at were probably out of reach. As in Chile, by the time the devaluation was

---

[14] On the other hand one could argue that domestic agents could have anticipated that the government would not stick to the fixed exchange rate since the external imbalance was unsustainable. If this was the case, the government should have compensated less for the effect of the devaluation.

effected (June 1970) it was already clear that the program was not sustainable. Krieger Vassena was forced to resign in 1969 as a result of labor unrest, primarily in Cordoba, an industrial city. His successor, Dagnino Pastore, initially adhered to the exchange rate policy but eventually was forced to devalue. This was a critical turning point in economic policy, as it marked the beginning of a long period of lax fiscal management and high inflation. The short term effects of the devaluation were an increase in inflation from 7 percent in 1969 to 35 percent in 1971. But more important than this short term costs (which clearly meant a reversal for the original program) was the fact that agents were left with the perception that price stability was a difficult goal to reach. The fact that an authoritarian government was forced to back up from a strong commitment reduced the chances that the ensuing administrations would attempt such a daring policy.

Finally, it is useful to try to evaluate the costs of reneging from a weak commitment. Are they indeed smaller? If we consider the period of the 1985-1989 period in Argentina and 1986-90 in Brazil, what we observe is a series of stabilization programs in both countries (the first ones being the Austral plan in Argentina and the Cruzado plan in Brazil) where the fixed exchange was perceived as a temporary device to generate transitory price stability.[15] The large reliance on income policies in these programs, especially in the follow-ups to the original plans, was an indication of their weakness. The analysis in Kiguel and Liviatan (1991) indicates that in contrast to Chile, the failure of the successive plans did not produce large costs in terms of output losses (certainly nothing like in Chile). On the other hand, the continuous failure to bring down inflation for long periods

---

[15] Kiguel and Liviatan (1991) provide a fuller discussion of these programs.

increased nominal instability, eventually leading to a full blown hyperinflation in Argentina and a short one in Brazil. All in all, one ends up with the impression that indeed reneging on weaker commitments have smaller real costs.

IV. Concluding Remarks

The central message of this paper is that the cost of reneging is a key reason that holds policymakers back from making strong commitments on their exchange rate policy. The stronger the commitment to an exchange rate rule, the more difficult it is to deviate from it. The ability to stick to preannounced rules depends not only on the intentions of the policymakers but also on the type and size of shocks which affect the economy. When the economy is hit by a large shock it may be optimal to deviate from the rule even for a policymaker that is serious about the rule.

Exchange rate rules have been particularly important in disinflation programs. In those cases the announcement of a fixed exchange is intended to reverse inflationary expectations and convince the public that prices are going to stabilize. The policymaker (especially if he is serious about bringing down inflation) attempts to stick to the rule for as long as possible in order to convince the public about his determination to disinflate. However, in doing that he losses the ability to use the exchange rate to offset external shocks. As a consequence the use of exchange rate rules as instruments of stabilization also involves costs.

Full dollarization, an option that has been considered as a possible device for stabilizing high inflation, is one of the strongest forms of commitment. By accepting full dollarization, and hence giving up the

domestic currency, the policymaker forgoes two benefits: first, the capacity to obtain seigniorage, and second, the ability to devalue. Much of the existing literature emphasizes the first one, we will argue that the second one is at least as important, if not more.

Fischer (1982) argues that seigniorage is an important source of public revenues in developing countries. In Argentina, for example, seigniorage has been fluctuating between 3 and 6 percent of GDP during the seventies and eighties. Is revenue from seigniorage a strong enough reason to stop short of dollarization if a policymaker is willing to stabilize? Probably not. If a policymaker is truly committed to stabilization --in the sense of bringing down inflation to one digit-- then he must also be ready to take the fiscal measures to ensure the sustainability of the program. Given that seigniorage in low inflation economies net around 1 percent of GDP, if full dollarization is one of the few ways to ensure long term price stability then it is difficult to argue that this revenue is the main consideration for not dollarizing. A determined government should be willing and able to increase revenues or reduce expenditures by this relatively small amount.

The model developed in this paper provides an alternative explanation for stopping short of such a strong commitment. Policymakers are concerned that even strong commitments may have to be broken sometimes (when shocks are sufficiently large), and that there are costs associated with such a course of action. The debt crisis, the accompanying higher interest rates and the deterioration in the terms of trade periodically experienced by some Latin American countries is the type of shock that can lead to reneging on a commitment. In the 1982 crisis in Chile, these shocks were handled through a devaluation of the domestic currency, and even in that case there was a severe recession. An open question is how the Chilean government would have

handled that crisis if it had chosen full dollarization and what would have been the costs in that case? A stronger commitment such as dollarization would have triggered two opposing effects. On one hand, by reducing inflationary expectations further, it would have prevented some of the real appreciation, thus reducing some of the cost of sticking to the commitment. On the other hand, the Chilean government would probably have adhered to the commitment for a longer time in the face of the adverse external shocks. This would have increased costs. Thus the overall effect of the stronger commitment on costs is ambiguous. But it is likely that in its presence devaluation would have been postponed even further. Nonetheless, one cannot rule out the possibility that the authorities would ultimately have reneged even under full dollarization.

Many economists believe that revenue from seigniorage is the main argument for maintaining a national currency. Others claim that issues related to national pride are also important (and they probably are). In our view, an equally (if not more) important motive for stopping short of full dollarization are the difficulties and costs of reneging on such a commitment when the country faces large adverse shocks, whose adverse effects can be alleviated, at least temporarily, by a devaluation.

References

Bruno, M., S. Fischer, E. Helpman and N. Liviatan (1991). Lessons from Stabilization and Its Aftermath, Cambridge: MIT Press.

Canavese, Alfredo (1992). "Hyperinflation and Convertibility Based Stabilization in Argentina," mimeo, Instituto Di Tella, Buenos Aires.

Corbo, V. (1985). "Reforms and Macroeconomic Adjustments in Chile during 1974-83," World Development, Vol. 13 No.8, pp. 893-916.

Cukierman, Alex (1992). Central Bank Strategy, Credibility and Independence: Theory and Evidence, Cambridge, MA., The MIT Press, Forthcoming.

De Pablo, Juan Carlos. (1972). Politica Anti-inflacionaria en la Argentina 1967-1970. Buenos Aires: Amorrortu Editores.

Edwards, Sebastian and Alejandra Cox Edwards. (1987). Monetarism and Liberalization: The Chilean Experiment, Cambridge, Massachusetts: Ballinger Publishing Company.

Fischer, S. (1982). "Seigniorage and the Case for a National Money," Journal of Political Economy, Vol 90, pp.295-313, April.

Flood, Robert P. and Peter Isard (1989). "Monetary Policy Strategies" IMF Staff Papers, Vol. 36. pp. 612-632, September.

Giavazzi, Francesco and Marco Pagano (1990). "Can Severe Fiscal Contractions be Expansionary?: Tales of Two Small European Countries," in NBER Macroeconomics Annual, Olivier Blanchard and Stanley Fischer editors,

Kiguel, Miguel and Nissan Liviatan (1991). "The Inflation Stabilization Cycles in Argentina and Brazil," in Lessons from Stabilization and Its Aftermath, editors M. Bruno, S. Fischer, E. Helpman and N. Liviatan, Cambridge, MIT Press.

Lohmann, Susanne (1992) "Optional Commitment in Monetary Policy: Credibility Versus Flexibility", American Economic Review, Vol. 82, Forthcoming.

Marshall, Jorge and Klaus Schmidt-Hebbel (1991). "Macroeconomics of Public Sector Deficits: The Case of Chile," mimeo, The World Bank.

Viana, Luis (1989) "The Stabilization Plan of 1968," mimeo, CERES Uruguay.

Appendix

1. Derivation of a condition for the emergence of a commitment. The expected value of D's objective function in stage 1 (equation [10]) is given by

$$Q = E_x J^D = \int_0^{x_c} -(1-\alpha c)\frac{x^2}{h} f(x)\,dx - \int_{x_c}^{a}\left(\frac{1}{2h}x^2 + bc\right) f(x)\,dx \qquad \text{(A-2)}$$

Using the uniform distribution over the range [0,a] with density $f(x) = K$, so that ak=1, we can write (A-1) as (equation [11])

$$aQ(c) = -\frac{(\frac{1}{2}-\alpha c)}{3h}x_c^3 - \frac{1}{6h}a^3 + bcx_c - bca \qquad \text{(A-2)}$$

Since $x_c = (2hbc)^{\frac{1}{2}}$ we have $aQ(0) = -\frac{a^3}{6h}$. Hence

$$a(Q(1) - Q(0) = \left(\frac{\alpha-\frac{1}{2}}{3h}\right)x_{c1}^3 + bx_{c1} - ba \qquad \text{(A-3)}$$

where $x_c = (2bh)^{\frac{1}{2}}$ is the value of x_c at c=1.

2. Demonstration that the optimal c is always at a corner. Differentiating (A-2) with respect to c we obtain

$$\frac{\partial aQ(c)}{\partial c} = -(\frac{1}{2}-\alpha c)x_c^2\frac{\partial x_c}{\partial c} + \frac{\alpha}{3h}x_c^3 + bx_c \qquad \text{(A-4)}$$

$$+ bc\frac{\partial x_c}{\partial c} - ba$$

Note that $\frac{\partial x_c}{\partial c} = hbx_c^{-1}$. Substituting in (A-4) and rearranging we obtain

$$\frac{\partial aQ(c)}{\partial c} = \alpha cbx_c + \frac{\alpha}{3h}x_c^3 + b(x_c - a) \qquad \text{(A-5)}$$

Since x_c is an increasing function of c this expression increases in c. Hence the second partial derivative with respect to c is positive for all c>0. This implies corner solutions at c=0 or c=1. Thus (A-3) is the only relevant criterion for determining c.

3. Extension to the case of a general density function and the existence of an internal solution

From equation (9) with h = b = 1 we have

$$Q(c) = \int_o^{x_c} -(1-\alpha c)\, x^2 dF(x) - \int_{x_c}^{\infty} \left(\frac{x^2}{2} + c\right) dF(x) \qquad \text{(A-6)}$$

where $x_c = (2c)^{\frac{1}{2}}$. The first order condition for optimality is

$$Q'(c) = \int_o^{x_c} \alpha x^2\, dF(x) - (1-\alpha c)(2c)^{\frac{1}{2}} f(x_c) - \int_{x_c}^{\infty} dF(x) + (2c)^{\frac{1}{2}} f(x_c) = 0$$

where $f = \frac{dF(x)}{dx}$ is the density function. This can be simplified to

$$Q'(c) = \alpha \int_o^{x_c} x^2 dF(x) - \int_{x_c}^{\infty} dF(x) + (2c)^{\frac{1}{2}} cf(x_c)\alpha = 0 \ . \qquad \text{(A-7)}$$

It can be seen that all the expressions in Q'(c) are increasing in c except for $f(x_c)$ which may be decreasing. Since in general f' can be changed arbitrarily for a given f and a given x_c there generally exist distributions that yield an internal solution ($o < c < 1$) for c. Such solutions always

occur on a downward sloping portion of the density function, i.e., where $f' < o$ and $Q''(c) < o$.

Since Q^1 is increasing in α, it follows from the second order condition that an increase in α raises c (as in the text). Note also that a shift in the probability mass to the right of x_c reduces $Q^1(c)$ which means that it decreases the optimal c. This is the equivalent result to that of an increase in 'a' in the uniform distribution as discussed in the text.

Policy Research Working Paper Series

	Title	Author	Date	Contact for paper
WPS906	Bulgaria's Evolving Legal Framework for Private Sector Development	Cheryl W. Gray Peter Ianachkov	May 1992	CECSE 37188
WPS907	Institutional Reform in Emerging Securities Markets	Robert Pardy	May 1992	Z. Seguis 37664
WPS908	Tax Incentives, Market Power, and Corporate Investment: A Rational Expectations Model Applied to Pakistani and Turkish Industries	Dagmar Rajagopal Anwar Shah	May 1992	C. Jones 37669
WPS909	Parallel Markets, the Foreign Exchange Auction, and Exchange Rate Unification in Zambia	Janine Aron Ibrahim A. Elbadawi	May 1992	V. Barthelmes 39175
WPS910	Policy Issues in Financial Regulation	Dimitri Vittas	May 1992	W. Pitayatonakarn 37666
WPS911	Does Exchange Rate Volatility Hinder Export Growth? Additional Evidence	Ying Qian Panos Varangis	May 1992	D. Gustafson 33714
WPS912	Understanding the Investment Cycle in Adjustment Programs: Evidence from Reforming Economies	Andrés Solimano	May 1992	E. Khine 39361
WPS913	The Women's Development Program in Rajasthan: A Case Study in Group Formation for Women's Development	Maitreyi Das	May 1992	L. Bennett 82772
WPS914	Health Personnel Development in Sub-Saharan Africa	J. Patrick Vaughan	May 1992	O. Nadora 31091
WPS915	Trade Policy and Exchange Rate Issues in the Former Soviet Union	W. Max Corden	May 1992	CECTP 37947
WPS916	Measuring the Risk of Default in Six Highly Indebted Countries	Marc Chesney Jacques Morisset	June 1992	S. King-Watson 31047
WPS917	Creditor Country Regulations and Commercial Bank Lending to Developing Countries	Asli Demirgüç-Kunt	June 1992	K. Waelti 37664
WPS918	Tax Evasion and Tax Reform in a Low-Income Economy: General Equilibrium Estimates for Madagascar	Jaime de Melo David Roland-Holst Mona Haddad	June 1992	D. Ballantyne 37947
WPS919	Fiscal and Quasi-Fiscal Deficits, Nominal and Real: Measurement and Policy Issues	Roberto de Rezende Rocha Fernando Saldanha	June 1992	L. Ly 37352

Policy Research Working Paper Series

	Title	Author	Date	Contact for paper
WPS920	Economic Incentives and Point Source Emissions: Choice of Modeling Platform	Raymond J. Kopp	June 1992	C. Jones 37754
WPS921	Road Infrastructure and Economic Development: Some Diagnostic Indicators	Cesar Queiroz Surhid Gautam	June 1992	M. Laygo 31261
WPS922	Central America at a Crossroads	Sylvia Saborio Constantine Michalopoulos	June 1992	M. Colinet 37044
WPS923	Listening to Firms: How to Use Firm-Level Surveys to Assess Constraints on Private Sector Development	Andrew H. W. Stone	June 1992	P. Infante 37642
WPS924	How Reduced Demand for Children and Access to Family Planning Accelerated the Fertility Decline in Colombia	Rafael Rofman	June 1992	O. Nadora 31091
WPS925	A General-Equilibrium-Based Social Policy Model for Côte d'Ivoire	Ngee-Choon Chia Sadek Wahba John Whalley	June 1992	A. Cox 34778
WPS926	Options for Reshaping the Railway	Neil E. Moyer Louis S. Thompson	June 1992	B. Gregory 33744
WPS927	General Equilibrium Effects of Investment Incentives in Mexico	Andrew Feltenstein Anwar Shah	June 1991	C. Jones 37699
WPS928	Pesticide Externalities, Comparative Advantage, and Commodity Trade: Cotton in Andhra Pradesh, India	Nalin M. Kishor	July 1992	D. Ballantyne 38004
WPS929	Managing Pollution Control in Brazil: The Potential Use of Taxes and Fines by Federal and State Governments	Antonio Estache Kangbin Zheng	July 1992	A. Estache 81442
WPS930	Participatory Development: Myths and Dilemmas	Robert Picciotto	July 1992	A. Muhtasib 84573
WPS931	How Much to Commit to an Exchange Rate Rule: Balancing Credibility and Flexibility	Alex Cukierman Miguel A. Kiguel Nissan Liviatan	July 1992	R. Luz 34303